

School District of La Crosse

Sixth Grade Science Curriculum

Developed for Implementation in 2003-2004

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Guiding Principles for Curriculum Development

School District of LaCrosse

Board of Education's ENDS Policies
Adopted 2001

E-1 District Mission

Students will discover their talents and abilities and will be prepared to pursue their dreams and aspirations while contributing effectively to their diverse communities.

E-2 Academic Achievement Goals

Students will demonstrate continuous improvement toward a high level of individual success in all required and elective academic/curricular areas using multiple measures of performance.

E-3 Involved Citizenship

Students will strive for mutual understanding as contributing citizens in a diverse world.

E-4 Responsible Life Choices

Students will acquire the knowledge and skills necessary to make effective and responsible life choices.

Wisconsin Academic Model Standards

All district curricula will be aligned to the Wisconsin Model Academic Standards available on the web at <http://www.dpi.state.wi.us/dpi/standards/sciintro.html>.

District Non-Discrimination Policy

It is the policy of the School District of La Crosse that no person may be denied admission to any public school in this district or be denied participation in, be denied the benefits of, or be discriminated against in any curricular, extracurricular, pupil service, recreation, or other program or activity because of the person's sex, race, religion, national origin, ancestry, creed, pregnancy, marital or parental status, sexual orientation, or physical, mental, emotional, or learning disability or handicap as required by s. 118.13 Wis. Stats., and/or section 504 of the Rehabilitation Act of 1973.

Science: Sixth Grade

Unit: Physical Science: Matter

Time Line: One quarter

Unit Sub-Topics:

- States (phases) of Matter
- Properties of Matter
- Physical and Chemical Changes
- Structure of Atoms
- Periodic Table
- Structure of Matter
- Analysis of Matter

Wisconsin State Standards:

A.8.1, A.8.2, A.8.4, A.8.4, A.8.5,
B.8.1, B.8.2, B.8.3, B.8.5, B.8.6, C.8.1,
C.8.2, C.8.3, C.8.4, C.8.5, C.8.6, C.8.9,
D.8.1, D.8.2, D.8.3, D.8.4, D.8.5, D.8.6,
D.8.7, D.8.9, D.8.10, G.8.1, G.8.2,
G.8.3, G.8.6, H.8.3

Learner Outcomes:

Students will learn:

- To observe, predict, record and make a conclusion based on the results.
- To identify the five states (phases) of matter – solids, liquids, gases, plasma, and super-atoms.
- To recognize that matter has physical and chemical properties.
- To distinguish the difference between physical and chemical changes.
- That energy content determines different states (phases) of matter.
- The structure of the atom (protons, neutrons, electrons, and nucleus).
- All matter is made up of approximately 100 elements. These elements are arranged on a periodic table in a very systematic order.
- To compare and contrast an element, a mixture, and compound.
- To analyze the composition of a chemical formula.
- To explain and give an example of the law of conservation of matter.
- That energy comes in different forms which can be changed from one form to another.
- That in most chemical reactions energy is seen as heat or light (conservation of energy).
- To test and identify substances as acids, bases, or neutrals.
- To explain how our knowledge of the atomic structure of matter has changed over time.

Instructional Strategies:

- KWL – Chart – What do you know? What do you want to know? What have you learned?
- Concept Webs
- Venn Diagrams
- Mapping
- T-Charts

Integration:**Suggested Activities/Resources:**

- Textbook – Matter: The Building Blocks of the Universe
- Matter and Energy – District document – Yellow
- District Kit
- Mr. Wizard Videos
- Bill Nye The Science Guy Videos
- Molecule Building Kit

Suggested Assessments:

- Chapter/Unit Tests
- Projects
- Hands-on Investigations
- Quizzes
- Oral and Written Reports
- Research Projects
- Labs
- Classroom Assessment

Science: Sixth Grade

Unit: Earth & Space Science: Astronomy

Time Line: 5-9 Weeks

Unit Sub-Topics:

- History
- Stars and Galaxies
- Constellations and Myths
- Telescopes

Wisconsin State Standards:

A.8.1, A.8.2, A.8.3, A.8.4, A.8.5,
A.8.6, B.8.1, B.8.2, B.8.5, B.8.6, C.8.1,
D.8.5, D.8.8, E.8.7, G.8.1, G.8.2, G.8.3,
G.8.6, H.8.1

Learner Outcomes:

Students will learn:

- To identify key people and their contributions to the science of astronomy and space travel.
- That the Earth is one of several planets that orbit the Sun, and the Moon orbits the Earth.
- To describe the life cycle of a star.
- To define a constellation.
- To recognize the major constellations of the Western Hemisphere and the influences constellations had throughout history.
- That the sun is a medium-sized star, located at the edge of a disk-shaped galaxy, part of which can be seen on a clear night as a glowing band of light.
- How telescopes function.
- The past, present, and future accomplishments and goals of the space program.
- To describe the Universe, Galaxies, and the Solar System and their relationships.

Instructional Strategies:

- KWL – Chart – What do you know? What do you want to know? What have you learned?
- Concept Webs
- Venn Diagrams
- Mapping
- Student Projects
- Timelines
- Planetarium – Central High School or Star Lab
- Given a pattern of dots, create a constellation
- Build models of sun, moon, and constellations
- T-Charts

Integration:

Suggested Activities/Resources:

- Teacher – The present “Astronomy Today” book is out of print and out of stock
- H.A. Rey – “The Stars”
- “Look to the Sky” – Jerry DeBruin and Don Murad
- Student Materials – Present District Kit
- Telescopes – Central High School Planetarium Director

Suggested Assessments:

- Chapter/Unit Tests
- Lab Reports
- Research Papers
- Oral Reports
- Quizzes
- Classroom Assessments

Science: Sixth Grade

Unit: Energy

Time Line: 9 Weeks

Unit Sub-Topics:

- Batteries
- Forces
- Motors

Wisconsin State Standards:

A.8.1, A.8.2, A.8.3, A.8.4, A.8.5, A.8.6, A.8.8, B.8.1, B.8.2, B.8.3, B.8.5, B.8.6, C.8.1, C.8.2, C.8.3, C.8.4, C.8.5, C.8.6, C.8.7, C.8.8, C.8.9, C.8.10, C.8.11, D.8.1, D.8.4, D.8.5, D.8.6, D.8.7, D.8.8, D.8.9, F.8.10, G.8.1, G.8.2, G.8.3, G.8.5, G.8.6, H.8.1, H.8.2, H.8.3

Learner Outcomes:

Students will learn that:

- A wet-cell battery is made using two different metals and a liquid electrolyte.
- Batteries produce electrical energy.
- Batteries contain a limited amount of energy.
- Charging a storage battery puts energy back into it.
- The energy stored in a battery can be converted into different forms, such as light, heat, and mechanical energy. Energy is conserved.
- The amount of energy stored in a rechargeable battery depends on the time the battery is charged.
- Forces are pushes or pulls.
- There are different kinds of forces and each has unique properties.
- Elastic forces are proportional to the stretch of the elastic material producing the force.
- The weight of an object is proportional to the mass of the object.
- The magnitude of sliding frictional force depends on the nature of the surface that it slides across.
- The magnitude of sliding frictional force is proportional to the weight of the object moving across a horizontal surface.
- When an applied force counterbalances frictional forces on it, an object moves at a constant speed.
- A motor exerts its maximum force under specific operation conditions.
- Work is the product of force and distance.
- A motor does work when lifting a load.
- Power is the rate of doing work.
- The power of a motor is proportional to the number of batteries connected to it in series.
- Falling bodies release potential energy and can provide energy to light a bulb.

Instructional Strategies:

- KWI – Note taking – Study Skills
- Labs
- Process Skills: Observing, Measuring and Identifying Properties; Seeking Evidence; Recognizing Patterns and Cycles; Identifying Cause and Effect; Extending the Senses; Designing and Conducting Controlled Experiments
- Learning Cycle: Focus – Explore – Reflect – Apply
- Demonstrations
- Mapping/Venn Diagrams
- Graphs/Charts

Integration:

- Career Exploration – NSP/Xcel Energy
- Graphs and Charts – Math
- Writing Reports, Lab Results – Language Arts
- Using Technology to generate graphs/charts
- Environmental Education – Wind Generators
- Web sites – NSTA.com, SciLinks

Suggested Activities/Resources:

- Energy, Machines, and Motion – STC Kit
- Bill Nye Science Guy videos
- Websites: SciLinks, NSTA
- Vernon Electric, Xcel Energy, NSP or Dairyland Power
- Field Trips: Skipperliner, French Island Incinerator, Lock and Dam
- UWL – Physic’s Department

Suggested Assessments:

- Building Models
- Pre-Assessments
- Notebook Checks
- Written Observation
- Drawings
- Graphs/Tables/Charts
- Group Presentations
- Cooperative Groups
- Performance Assessment
- Unit Tests and Quizzes

Science: Sixth Grade

Unit: Machines

Time Line: 4.5 Weeks

Unit Sub-Topics:

- Incline Plane
- Pulleys
- Levers
- Mechanical Advantage
- Efficiency

Wisconsin State Standards:

A.8.1, A.8.2, A.8.3, A.8.4, A.8.5, A.8.6,
A.8.8, B.8.1, B.8.2, B.8.3, B.8.5, B.8.6,
C.8.1, C.8.2, C.8.3, C.8.4, C.8.5, C.8.6,
C.8.7, C.8.8, C.8.9, C.8.10, C.8.11,
D.8.1, D.8.4, D.8.5, D.8.6, D.8.7, D.8.8,
D.8.9, F.8.10, G.8.1, G.8.2, G.8.3,
G.8.5, G.8.6, H.8.1, H.8.2, H.8.3

Learner Outcomes:

Students will learn that:

- Machines make doing work easier by reducing the effort needed to do a given amount of work.
- The force to move an object up an incline plane is proportional to the angle of the incline.
- Incline planes are machines.
- The effort force to lift a load using a pulley system depends on the number of pulleys and how they are connected to the load.
- Pulley systems are machines.
- Levers balance when the product of a weight and its distance from the fulcrum on one arm are equal to the product of another weight and its distance from the fulcrum on the other arm.
- A lever is a machine.
- Mechanical advantage describes how much machines multiply effort of force.
- Actual mechanical advantage is less than ideal mechanical advantage because of friction.
- Efficiency is the ratio of work output to work input.
- Technology design is a process to create solutions to meet human needs.

Instructional Strategies:

- KWL - Note Taking - Study Skills
- Labs
- Process Skills: Observing, Measuring and Identifying Properties; Seeking Evidence; Recognizing Patterns and Cycles; Identifying Cause and Effect; Extending the Senses; Designing and Conducting Controlled Experiments
- Learning Cycle: Focus – Explore – Reflect – Apply
- Demonstrations
- Mapping/Venn Diagrams
- Graphs/Charts

Integration:

- Career Exploration - NSP/Xcel Energy
- Graphs & Charts - Math
- Writing up reports, lab results - Language Arts
- Using Technology to generate graphs/charts
- Environmental Education - Wind Generators
- Web sites - NSTA.com, SciLinks

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- Field Trips s - Skipperliner - French Island Incinerator - Lock and Dam
- U.W- L - Physic's Department

Suggested Assessments:

- Building Models
- Pre - Assessments
- Notebook Checks
- Written Observations
- Drawings
- Graphs/Tables/Charts
- Group Presentations
- Cooperative Groups
- Performance Assessment
- Unit Tests and Quizzes

Science: Sixth Grade

Unit: Motion

Time Line: 4.5 Weeks

Unit Sub-Topics:

- Application of Motion
- Potential and Kinetic Energy
- Speed/Rate
- Acceleration

Wisconsin State Standards:

A.8.1, A.8.2, A.8.3, A.8.4, A.8.5, A.8.6,
A.8.8, B.8.1, B.8.2, B.8.3, B.8.5, B.8.6,
C.8.1, C.8.2, C.8.3, C.8.4, C.8.5, C.8.6,
C.8.7, C.8.8, C.8.9, C.8.10, C.8.11,
D.8.1, D.8.4, D.8.5, D.8.6, D.8.7, D.8.8,
D.8.9, F.8.10, G.8.1, G.8.2, G.8.3,
G.8.5, G.8.6, H.8.1, H.8.2, H.8.3

Learner Outcomes:

Students will learn that:

- Scientific researchers use a variety of resources to gather and document information
- Unbalanced forces change the motion of objects.
- Average speed is distance traveled divided by time of travel
- A constant unbalanced force can make an object steadily increase speed
- Friction can act against the motion of an object and decrease its speed
- Changes in motion are a result of the combined action of applied forces and friction
- Energy can be stored in a compressed spring
- Kinetic energy is energy of motion
- Energy stored in a spring can become kinetic energy
- Friction works to reduce the kinetic energy of moving objects
- Gravitational potential energy is energy associated with the position of an object
- Gravitational potential energy and kinetic energy can interchange forms as an object changes height. Energy is conserved.

Instructional Strategies:

- KWL - Note Taking - Study Skills
- Labs
- Process Skills: Observing, Measuring and Identifying Properties; Seeking Evidence; Recognizing Patterns and Cycles; Identifying Cause and Effect; Extending the Senses; Designing and Conducting Controlled Experiments
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- Unit Tests and Quizzes

Wisconsin Model Academic Standards 6 th Grade Standards Analysis		Matter	Astronomy	Energy, Machines & Motion
A. Science Connections				
A.8.1	Develop their understanding of the science themes by using the themes to frame questions about science-related issues and problems.	✓	✓	✓
A.8.2	Describe limitations of science systems and give reasons why specific science themes are included in or excluded from those systems.	✓	✓	✓
A.8.3	Defend explanations and models by collecting and organizing evidence that supports them and critique explanations and models by collecting and organizing evidence that conflicts with them.		✓	✓
A.8.4	Collect evidence to show that models developed as explanations for events were (and are) based on the evidence available to scientists at the time.	✓	✓	✓
A.8.5	Show how models and explanations, based on systems, were changed as new evidence accumulated (the effects of constancy, evolution, change, and measurement should all be part of these explanations.)	✓	✓	✓
A.8.6	Use models and explanations to predict actions and events in the natural world.		✓	✓
A.8.7	Design real or thought investigations to test the usefulness and limitations of a model.			
A.8.8	Use the themes of evolution, equilibrium, and energy to predict future events or changes in the natural world.			✓
B. Nature of Science				
B.8.1	Describe how scientific knowledge and concepts have changed over time in the earth and space, life and environmental, and physical sciences.	✓	✓	✓
B.8.2	Identify and describe major changes that have occurred over in conceptual models and explanations in the earth and space, life and environmental, and physical sciences and identify the people, cultures, and conditions that led to these developments.	✓	✓	✓
B.8.3	Explain how the general rules of science apply to the development and use of evidence in science investigations, model making, and applications.	✓		✓
B.8.4	Describe types of reasoning and evidence used outside of science to draw conclusions about the natural world.			
B.8.5	Explain ways in which science knowledge is shared, checked, and extended, and show how these processes change over time.	✓	✓	✓
B.8.6	Explain the ways in which scientific knowledge is useful and also limited when applied to social issues.	✓	✓	✓
C. Science Inquiry				
C.8.1	Identify questions they can investigate using resources and equipment they have available.	✓	✓	✓

Wisconsin Model Academic Standards 6 th Grade Standards Analysis		Matter	Astronomy	Energy, Machines & Motion
C.8.2	Identify data and locate sources of information including their own records to answer the questions being investigated.	✓		✓
C.8.3	Design and safely conduct investigations that provide reliable quantitative or qualitative data, as appropriate, to answer their questions.	✓		✓
C.8.4	Use inferences to help decide possible results of their investigations, use observations to check their inferences.	✓		✓
C.8.5	Use accepted scientific knowledge, models, and theories to explain their results and to raise further questions about their investigations.	✓		✓
C.8.6	State what they have learned from investigations, relating their inferences to scientific knowledge and to data they have collected.	✓		✓
C.8.7	Explain their data and conclusions in ways that allow an audience to understand the questions they selected for investigation and the answers they have developed.	✓		✓
C.8.8	Use computer software and other technologies to organize, process, and present their data.	✓		✓
C.8.9	Evaluate, explain, and defend the validity of questions, hypotheses, and conclusions to their investigations.	✓		✓
C.8.10	Discuss the importance of their results and implications of their work with peers, teachers, and other adults.			✓
C.8.11	Raise further questions which still need to be answered.			
D. Physical Science				
PROPERTIES AND CHANGES OF PROPERTIES IN MATTER				
D.8.1	Observe, describe, and measure physical and chemical properties of elements and other substances to identify and group them according to properties such as density, melting points, boiling points, conductivity, magnetic attraction, solubility, and reactions to common physical and chemical tests.	✓		✓
D.8.2	Use the major ideas of atomic theory and molecular theory to describe physical and chemical interactions among substances, including solids, liquids, and gases.	✓		
D.8.3	Understand how chemical interactions and behaviors lead to new substances with different properties.	✓		
D.8.4	While conducting investigations, use the science themes to develop explanations of physical and chemical interactions and energy exchanges.	✓		✓
MOTIONS AND FORCES				
D.8.5	While conducting investigations, explain the motion of objects by describing the forces acting on them.	✓	✓	✓
D.8.6	While conducting investigations, explain the motion of objects using concepts of speed, velocity, acceleration, friction, momentum, and changes over time among others, and apply these concepts and			✓

Wisconsin Model Academic Standards		Matter	Astronomy	Energy, Machines & Motion
	explanations to real-life situations outside the classroom.			
D.8.7	While conducting investigations of common physical and chemical interactions occurring in the laboratory and the outside world, use commonly accepted definitions of energy and the idea of energy conservation.	✓		✓
TRANSFER OF ENERGY				
D.8.8	Describe and investigate the properties of light, heat, gravity, radio waves, magnetic fields, electrical fields, and sound waves as they interact with material objects in common situations.		✓	✓
D.8.9	Explain the behaviors of various forms of energy by using the models of energy transmission, both in the laboratory and in real-life situations in the outside world.	✓		✓
D.8.10	Explain how models of the atomic structure of matter have changed over time, including historical models and modern atomic theory.	✓		
E. Earth and Space Science				
STRUCTURE OF EARTH SYSTEM				
E.8.1	Using the science themes, explain and predict changes in major features of land, water and atmospheric systems.			
E.8.2	Describe underlying structures of the earth that cause changes in the earth's surface.			
E.8.3	Using the science themes during the process of investigation, describe climate, weather, ocean currents, soil movements and changes in the forces acting on the earth.			
E.8.4	Using the science themes, analyze the influence living organisms have had on the earth's systems, including their impact on the composition of the atmosphere and the weathering of rocks.			
EARTH'S HISTORY				
E.8.5	Analyze the geologic and life history of the earth, including change over time, using various forms of scientific evidence.			
E.8.6	Describe through investigations the use of the earth's resources by humans in both past and current cultures, particularly how changes in the resources used for the past 100 years are the basis for efforts to conserve and recycle renewable and non-renewable resources.			
EARTH IN THE SOLAR SYSTEM				
E.8.7	Describe the general structure of the solar system, galaxies, and the universe, explaining the nature of the evidence used to develop current models of the universe.		✓	
E.8.8	Using past and current models of the structure of the solar system, explain the daily, monthly, yearly, and long-term cycles of the earth, citing evidence gained from personal observation as well as evidence used by scientists			

Wisconsin Model Academic Standards		Matter	Astronomy	Energy, Machines & Motion
F. Life and Environmental Science				
STRUCTURE AND FUNCTION IN LIVING THINGS				
F.8.1	Understand the structure and function of cells, organs, tissues, organ systems, and whole organisms.			
F.8.2	Show how organisms have adapted structures to match their functions, providing means of encouraging individual and group survival within specific environments.			
F.8.3	Differentiate between single-celled and multiple-celled organisms (humans) through investigation, comparing the cell functions of specialized cells for each type of organism.			
REPRODUCTION AND HEREDITY				
F.8.4	Investigate and explain that heredity is comprised of the characteristic traits found in genes within the cell of an organism.			
F.8.5	Show how different structures both reproduce and pass on characteristics of their group.			
REGULATION AND BEHAVIOR				
F.8.6	Understand that an organism is regulated both internally and externally.			
F.8.7	Understand that an organism's behavior evolves through adaptation to its environment.			
POPULATIONS AND ECOSYSTEMS				
F.8.8	Show through investigations how organisms both depend on and contribute to the balance or imbalance of populations and/or ecosystems, which in turn contribute to the total system of life on the planet.			
DIVERSITY AND ADAPTATIONS OF ORGANISMS				
F.8.9	Explain how some of the changes on the earth are contributing to changes in the balance of life and affecting the survival or population growth of certain species.			
F.8.10	Project how current trends in human resource use and population growth will influence the natural environment, and show how current policies affect those trends.			✓
G. Science Applications				
G.8.1	Identify and investigate the skills people need for a career in science or technology and identify the academic courses that a person pursuing such a career would need.	✓	✓	✓
G.8.2	Explain how current scientific and technological discoveries have an influence on the work people do and how some of these discoveries also lead to new careers.	✓	✓	✓

Wisconsin Model Academic Standards		6th Grade Standards Analysis		
		Matter	Astronomy	Energy, Machines & Motion
G.8.3	Illustrate the impact that science and technology have had, both good and bad, on careers, systems, society, environment, and quality of life.	✓	✓	✓
G.8.4	Propose a design (or re-design) of an applied science model or a machine that will have an impact in the community or elsewhere in the world and show how the design (or re-design) might work, including potential side-effects.			
G.8.5	Investigate a specific local problem to which there has been a scientific or technological solution, including proposals for alternative courses of action, the choices that were made, reasons for the choices, any new problems created, and subsequent community satisfaction.			✓
G.8.6	Use current texts, encyclopedias, source books, computers, experts, the popular press, or other relevant sources to identify examples of how scientific discoveries have resulted in new technology.	✓	✓	✓
G.8.7	Show evidence of how science and technology are interdependent, using some examples drawn from personally conducted investigations.			
H. Science in Personal and Social Perspectives				
H.8.1	Evaluate the scientific evidence used in various media (for example, television, radio, Internet, popular press, and scientific journals) to address a social issue, using criteria of accuracy, logic, bias, relevance of data, and credibility of sources.		✓	✓
H.8.2	Present a scientific solution to a problem involving the earth and space, life and environmental, or physical sciences and participate in a consensus-building discussion to arrive at a group decision.			✓
H.8.3	Understand the consequences of decisions affecting personal health and safety.	✓		✓

GLOSSARY OF TERMS

SCIENCE THEMES

Each of the following terms refers to a theme that connects and unifies the many disciplines of science. The themes are found particularly in Standard A and are mentioned consistently throughout the science standards. They are identified with an asterisk (*) each time they appear.

Change. A variance in the rate, scale, and pattern, including trends and cycles.

Constancy. The stability of a property, such as the speed of light.

Equilibrium. The physical state in which forces and changes occur in opposite and offsetting directions.

Evidence. Data and documentation that support inferences or conclusions.

Evolution. A series of changes, some gradual and some sporadic, that accounts for the present form and function* of objects.

Explanation. The skill of communication in which an interpretation of information is given and stated to others.

Form and Function. Complimentary aspects of objects, organisms, and systems in the natural world.

Measurement. The quantification of changes in systems, including mathematics.

Models. Tentative schemes or structures that correspond to real objects, events, or classes of events, and that have explanatory power.

Order. The behavior of units of matter, objects, organisms, or events in the universe.

Organization. Descriptions of systems based on complexity and/or order.

Systems. An organized group of related objects or components that form a whole.

TERMS UNIQUE TO SCIENCE

The following terms are used uniquely in science. They are used consistently throughout the standards and are identified by an asterisk (*) each time they appear. They represent the range of rigorous science skills and knowledge found in the standards.

Analyze. The skill of recognizing the underlying details of important facts or patterns that are not always readily visible.

Apply. The skill of selecting and using information in other situations or problems.

Construct. The skill of developing or creating.

Describe. The skill of developing a detailed picture or image.

Discover. The skill of learning through study or investigation.

Energy. The work that a physical system is capable of completing or doing.

Evaluate. The skill of collecting and examining data to make judgments and appraisals.

Group. The skill of identifying objects according to characteristics.

Identify. The skill of recognizing patterns, facts, or details.

Inference. The skill of using the results of an investigation based on a premise.

Illustrate. The skill of giving examples to describe something.

Interaction. The influence of objects, materials, or events on one another.

Investigate. Scientific methodology that systematically employs many inquiry skills.

Observation. The skill of describing scientific events.

Predict. The skill of explaining new events based on observations or information.

Relate. The skill of association.

Show. The skill of illustration.

Understand. The skill of having and applying well-organized bodies of knowledge.