Grade 8 Pedagogical Overview

In Grade 8, the students begin to adjust to early adolescence. The young person seems more robust than in the previous year. The world of ideas begins to take on meaning for the fourteen-year-old, and the critical faculties are noticeably sharper. At the same time, the elements of reasoning and self-reflection are steadily emerging. With the awakening capacity for logical thinking and free, independent judgment, the eighth grader now wants to be in the world more than ever before. They want to do, to discover, to know, and to find relevance in their studies by finding connections with the outside world. A search begins for new authority figures and social forms.

Throughout this year, the students continue to expand their sense of place in the world. The history curriculum moves from the 17th century through modern times, with emphasis placed on periods marked by revolution. The students study the Industrial Revolution as well as the French, American, and Haitian Revolutions, periods where common people strove for an independent voice. Focus is placed on the biographies of individuals who found the courage to follow their passions in revolt against the status quo.

In Language Arts, the students read biographies, historical fiction, and short stories. Their flexibility in composition develops through writing in narrative, descriptive, expository, and persuasive styles. They conclude their year with a large-scale dramatic production such as a musical or a Shakespeare play.

In mathematics, the students extend their knowledge of integers and algebra by learning to solve inequalities and to plot equations on the coordinate plane. A study of the conic sections and of solid geometry rounds out their mathematical experience.

In the sciences, students focus on the human being in anatomy, with an emphasis on the bones, muscles, and reproduction. In organic chemistry, with its attention to the carbohydrates, proteins, and fats that build up the human organism. The study of thermal physics, visual phenomena, electromagnetism, hydraulics and aero-mechanics helps students to work mentally with phenomena in an experiential way to find relationships between them. In addition to their continued inquiry into scientific phenomena and experimentation, students study the lives and struggles of scientists and inventors who first discovered chemical and electrical laws. These studies ground students in the human aspect of scientific thought, while providing a picture of the profound effects of modern technology upon society and culture.

Studies in Geography are focused on Asia, as the eighth graders create a rich picture of the physical, cultural, spiritual, and political conditions in which the people of Africa live. This provides them with a vivid picture of this region of the earth. This picture of the earth as a totality is reinforced through a meteorology block, where they explore the aspects of water and air pressure that make up our world's weather.

The eighth grade year is a culmination of all that the students have learned over the previous years. The teacher's goal is that they view the world with interest, confidence, and compassion, and that they engage with the world as striving, ethical individuals.

Language Arts Themes:

- Texts from influential writers of the 1700's to modern times
- Epic and dramatic poetry: sonnets, haiku, ballads
- Folklore and poems from around the world
- Review of grammar and syntax
- Newspaper articles and editorials
- Emphasis on note taking and journaling
- Weekly oral news reporting

Mathematics Themes:

- Practical mathematics
- Geometry: polygons, angles, area and volume, theorems, Platonic solids
- Algebra: operations with polynomials, equations, and basic probability
- Graphing coordinates
- Number bases, exponents, and set concepts
- Computers and the binary system

Social Studies Themes:

- 1700 to the present
- Contrasting the Reformation with the Age of Enlightenment
- The American, French, and Haitian Revolutions
- Industrial Revolution: rise of the factory; city life and child labor; early attempts at social reform
- American History: Colonization, The Declaration of Independence and the U.S. Constitution
- World economy, free trade, war and peace
- Biographies may include Napoleon, Harriet Tubman, Abraham Lincoln, Robert E. Lee, George Washington, Benjamin Franklin, Bismarck, Mahatma Gandhi, Joseph Stalin, Robespierre, Karl Marx, John Wilkes Booth, Susan B. Anthony, and Martin Luther King Jr.
- Geography of Asia, Australia, and Antarctica
- World Geography, including, tides, map reading, and weather
- Consideration of how maps influence our perceptions of the world
- Studies may also include the philosophies of Confucianism, Taoism, Buddhism, and Shintoism

Science Themes:

- Organic Chemistry: proteins, fats, sugars, and starches; nitrogen cycle; plant structure and chemical processes
- Anatomy: bones and muscles, nervous system, reproductive system, body chemistry and addiction
- Physics: heat, optics, current electricity, hydraulics, aerodynamics, meteorology,

Artistic Work:

- 3-dimensional geometry
- Ink brush in Asian style
- Watercolor painting
- Modeling human features in clay

- Practical skills classes (may include blacksmithing, silversmithing, glass blowing)

Specialty Subjects:

- Eurythmy
- Games
- Handwork
- Music

- Spanish
- Strings
- Woodwork
- Practical Arts (handwork, gardening, student action teams)

English and Language Arts

Eighth graders solidify all grammar skills and extend their understanding of adjective, adverb, and noun clauses. They also learn to work with participial, gerund, and infinitive phrases. Independent composition is emphasized in main lesson work. Research skills are developed further and are applied to subjects in the Main Lesson curriculum or biographies. Spoken work includes oral presentations on these subjects, reports on current events, and formal debates. Recitation often focuses on historical passages, such as Tom Paine's *Common Sense* or *Chief Seattle's Speech*. Readers continue to follow social studies themes, ranging from *The Master Puppeteer* and *Johnny Tremain* to *And There Was Light*. The class play is often a Shakespeare comedy, a modern play, or a musical. The students learn to develop character and incorporate dramatic technique into their performances.

Writing

In their eighth-grade year, students are expected to demonstrate a variety of writing styles and techniques to convey their own ideas, as well as the viewpoints of others. Throughout this year, they are asked to demonstrate flexibility and creativity in their thinking by conveying opinions from opposing sides of an issue. They may also be asked to prepare speeches and/or participate in class debates.

At the completion of Grade Eight, students should be able to:

- Demonstrate solid editing, proofreading, and revision skills
- Write legibly
- Exhibit clear thinking in writing
- Add details to clarify meaning or enhance impact of writing
- Demonstrate an expanded vocabulary in written work
- Provide more exact description throughout writing
- Demonstrate ability to work with different writing forms: expository, narrative, editorial, essay
- Identify and use simile and metaphor in writing
- Compare and contrast conflicting ideas
- Show narrative development in writing
- Analyze and discuss ideas by looking from multiple angles and through deeper layers of meaning
- Organize ideas to support the thesis of written work

Reading

This year's focus is on biography and historical fiction. 19th century authors such as Dickens, Melville, and Hardy may be introduced at this time. As in previous years, students are expected to continue independent reading throughout the year. Although they are encouraged to research their own interests, they also choose from a variety of fiction and nonfiction works from a reading list provided by their teacher.

At the completion of Grade Eight, students should be able to:

- Read for information from primary and secondary sources
- Read at least 12 books from an approved reading list
- Demonstrate reading comprehension, speed, and word recognition at an eighth-grade level or above
- Complete book report projects with written and oral components
- Draw critical conclusions from reading
- Read plays and other texts with understanding and clear expression
- Research social studies topics and complete written reports

Grammar and Study Skills

Over the course of the eighth grade, students work on developing the skills of essay writing, critical analysis in reading, and conducting research. Sentences are written in different ways to create a range of moods, such as: epic, descriptive, lyrical, dramatic, questioning, commanding, legalistic, nonsensical, satirical, or absurd. Conditional sentences are introduced to describe possibilities, expectations, and theoretical or impossible situations. These exercises help the self-occupied adolescent see other perspectives and speculate about the motivation or desires of others.

At the completion of Grade Eight, students should be able to:

- Demonstrate solid understanding of basic grammar and punctuation from previous years
- Use punctuation and capitalization appropriately, including semi-colons, colons, and commas
- Identify and use declarative, interrogative, exclamatory, and imperative statements
- Identify and use restrictive and non-restrictive clauses
- Understand simple, compound, and complex sentences
- Identify active and passive voice and verb tense
- Diagram simple sentences
- Show understanding of infinitive, gerund, and participle phrases
- Achieve at least 80% accuracy on spelling and vocabulary quizzes
- Maintain a standard of no more than 5 misspelled words per 100 on homework and in-class compositions
- Use resource materials as a tool to gain information
- Take notes during oral presentations

Mathematics

Stressing the beauty of mathematics continues to be an important goal during the eighth-grade year. Students should complete eighth-grade with a firm grasp of arithmetic operations with all rational numbers, and be competent working with rounding, estimation, and formulas. Word problems continue to be important—especially ones that test thinking against multiple-step problems and utilize analytical skills and problem-solving strategies.

Topics in basic descriptive statistics and introductory Algebra I are covered throughout the year. Every effort is made to present Algebra concepts in a clear and concrete way, and to provide differentiation in the lessons to meet differing developmental maturity levels in the students.

Geometry continues with the construction of more complex geometric drawings, including polygons, projections of 3-dimensional polyhedral, and nets to construct Platonic and Archimedean solids. Computation of areas of 2-dimensional figures and volume of 3-dimensional solids is explored, as well as the concepts of similarity and congruence of triangles, and an introduction to the Conic curves. A major theme throughout the students' mathematical experience is the equal emphasis on number and on geometric forms. This theme culminates in a Main Lesson Block on the five Platonic solids, in which the visualization and transformation of forms is blended with the derivation of their properties.

Major Topics of Study:

Number Sense and Computation:

- Conversions between fractions, decimals, and percent
- Percent calculations and conversions
- Estimation
- Investigative problems using a variety of problem-solving strategies
- Exponents and roots
- Introduction to calculator use

Patterns, Statistics, and Algebra:

- Number sequences
- Ratio, Proportion, and Rates
- Operations involving positive and negative numbers
- Complex order of operations
- Introduction to irrational numbers
- Use formulas to solve a variety of problems
- Introduction to Algebra: simplifying expressions and solving one and multi-step equations
- Mean, median, mode, range, quartiles

Geometry and Measurement:

- Measurement conversions, with particular emphasis on the metric system
- Area and perimeter of polygons and circles
- Pythagorean Theorem and Golden Ratio
- Basic geometric theorems: Angle theorems, Interior Angles in a Triangle Theorem

At the completion of Grade Eight, students should be able to:

Number Sense and Computation:

- Represent the value of a number in a variety of forms (standard, expanded, and scientific notation)
- Understand the structure of Real Number system
- Convert between fractions, decimals, and percent
- Estimate solutions to problems involving whole numbers, fractions, decimals, and percent.
- Convert between base ten, binary, octal and hexadecimal numbers
- Work extensively with least common multiples and greatest common factors
- Understand squared and cubed numbers and their respective roots

- Simplify and perform operations with radicals
- Estimate and round
- Use a calculator to add, subtract, multiply, divide, and raise to a power integer and rational numbers

Patterns, Statistics, and Algebra

- Interpret, extend, and create complex number patterns
- Describe and analyze patterns and relationships using tables, coordinate graphs, verbal rules, and standard algebraic notation
- Simplify numeric expressions using the correct order of operations
- Demonstrate understanding of the commutative, associative, and distributive properties with addition and multiplication
- Simplify and find equivalent ratios
- Understand algebraic vocabulary: term, coefficient, polynomial, base, exponent
- Use formulas to solve a variety of problems
- Identify and plot ordered pairs on a cartesian coordinate plane
- Set up and solve a proportion
- Simplify linear expressions
- Operations on polynomials
- Solve and graph linear equations, and linear inequalities
- Simplify expressions with positive and negative exponents
- Solve systems of linear equations using graphing, substitution, and elimination techniques
- Simplify and solve quadratic expressions and equations using factoring and the Zero-Product Property
- Calculate mean, median, mode, data range, quartiles, interquartile range, and mean absolute deviation
- Generate and organize data in a variety of ways (tables, charts, graphs)
- Participate productively in group work activities

Geometry and Measurement

- Use a compass and ruler to accurately draw geometric constructions
- Use of the Pythagorean Theorem to find a missing side in a triangle
- Compute area and perimeter of parallelograms, trapezoids, circles, and regular polygons
- Compute surface area of solids
- Use formulas to calculate the volume of prisms, cylinders, pyramids, cones, spheres
- Construct Platonic and some Archimedean solids with paper nets
- Measure and construct angles using a protractor
- Use basic angle theorems to calculate missing angles
- Estimate and measure using standard and metric units

Science

In Grade 8, the subject of physics includes two new areas. The first is current electricity, in which students begin by making practical devices such as a motor, and afterwards identify the electromagnetic principles involved. The second area is hydraulics and pneumatics. The concepts learned here are applied to a study of meteorology, which includes cloud formation,

weather fronts and barometric pressure. In chemistry, the students learn to perform tests for fats, carbohydrates, and proteins. These substances are related both to what is happening in the students' own metabolisms, and to practical applications such as soap, lip balm, or cold cream.

Physiology

In the 8th grade the skeleton is presented from the vantage points of protection, support, and movement. Students learn the major bones and also investigate the spinal cord and the arch of the foot, discovering their relation to uprightness. The unique form and function of the hand is highlighted through the comparison with animal limbs. Afterwards, emphasis is on the interplay of bones and muscles, in which pupils apply principles of levers that they learned in 7th grade Mechanics.

The focus then shifts to the development of the reproductive organs during puberty: the resulting physical changes and role of those organs in conception. Development of the embryo and fetus during pregnancy is described. Subsequent class discussion centers largely around the nature of healthy relationships, and love and responsibility. Consideration is also given to current social questions such as contraception, teen pregnancy, and gender stereotyping.

At the completion of Grade 8, students should be able to:

- Describe the skull's development in the embryo, fetus, infancy, and adulthood.
- Explain how the arch in the foot and the spine's curvature contribute to the human being's upright stature.
- Give example of bones whose primary function is either protection, support, or movement.
- Explain the advantages of an opposable thumb
- Describe the connections of a series of bones, e.g. from shoulder blade to fingertips.
- Describe the change in the spine's form following birth.
- Memorize the scientific names for various major bones.
- Distinguish among tendon, ligament, and cartilage.
- Give examples of first, second, and third-class levers in the joints of bones.
- Explain how muscles work in pairs.
- In a full-page illustration, depict the skeleton engaged in some common activity or movement.
- Identify the form and function of reproductive organs for both genders.
- Describe the development of form in the embryo and fetus.
- In a composition, reflect on what factors contribute to a healthy relationship.

Organic Chemistry

The thinking ability at this age is ready for more conceptualization, and children are increasingly interested in practical applications. The main theme of study is the way human nourishment involves a direct relationship to nature. Students investigate the qualities of carbohydrates (sugars, starches, and cellulose), proteins, oils, and fats. They learn to perform several tests themselves for the presence of these substances in foods. They also learn how to do papermaking with cellulose, manufacture glue from protein, and make emulsions such as soap and cosmetics from fats and oils. On a cultural level, they discover the multiple sources of sweeteners developed by humankind over thousands of years.

At the completion of Grade 8, students should be able to:

- Characterize the relationship of sugar to water and fire.
- Explain the terms, *solution*, *saturated solution*, *solute*, and *solvent*.
- Memorize the substances used to test various foods and explain the test procedure in each case.
- Perform tests for all foods and correctly interpret the results.
- Devise a test that demonstrates the conversion of starch to sugar using saliva.
- Distinguish between simple and complex sugars.
- Describe the procedure for breaking down a complex sugar.
- Cite four different types of sugar.
- Develop their own main lesson page, with writing and illustration that depicts humankind's sources of sweeteners over the ages.
- Identify the particular parts of a plant where sugar, starch and cellulose are found.
- Describe the procedure for the destructive distillation of wood and identify the substances that result.
- Characterize the relationship of milk to sugar, protein and fat.
- Describe the relationship of oils and fats to water and fire.
- Explain the difference between oil and fat and distinguish saturated fat from unsaturated fat.

<u>Physics – Current Electricity</u>

This lesson begins with the generation of current electricity through chemical means, the Voltaic cell. Students then witness the creation of magnetism by a wire with an electrical current, and the creation of an electrical current through the movement of a magnet – the two effects that led to the electric motor and the electric generator. A large number of electrical phenomena are explored. There is a strong emphasis on practical applications, and the eighth graders make and analyze several devices themselves. Class discussion focuses on the continual development of the electronic world, citing both advantages and disadvantages. The role of transistors, semiconductors and the computer in this development are carefully considered.

At the completion of Grade 8, students should be able to:

- Explain how to generate electricity with a Voltaic cell and a Voltaic pile.
- Describe the varied reactions of a compass when (1) a current-carrying wire is held either parallel or perpendicular to it, and (2) the wire ends are switched to the opposite battery terminals.
- Use a coil of wire to make an electromagnet.
- Make a conductivity detector and identify materials that conduct electricity and those that do not.
- Diagram series and parallel wiring.
- Indentify an electrical current's direction of flow.
- Make a telegraph and switch and send Morse code messages.
- Develop a main lesson page that illustrates and explains clearly how the telegraph works.
- Make and operate a simple motor.
- Cite when electricity is in the motor's coil and when it is not; cite the point at which the magnetic polarity of the coil reverses.
- Identify rotating magnets in a hand generator.

<u>Physics – Hydraulics, Pneumatics, and Meteorology</u>

The first area of study is of gases and fluids in relation to heat and pressure, with numerous

practical examples. Following an investigation of the Archimedean Principle, students learn of the relation between density and buoyancy. The generation of a vacuum in a bell jar leads to the exploration of a lift pump and siphon.

Following the examination of air and water pressure, the class sees these forces applied to the weather around them. They make simple barometers and compare the pressure daily with the current weather conditions. Their careful observation of clouds leads to a basic classification of clouds. They then learn of the warming and cooling trends that account for wind patterns. They also study air masses, fronts, and the phenomena of major storms and their role as pressure release valves in the world's weather system.

At the completion of Grade 8, students should be able to:

- Describe the troposphere in terms of height and its content of air and water.
- Define *condensation* and *evaporation* in terms of changing states of matter.
- Explain how a cloud forms.
- Name the three basic types of clouds and describe their altitude and form.
- Explain what a thermal is and cite types of land where it occurs.
- Describe the movement and temperature involved in land breezes and sea breezes.
- Identify the four types of air masses found in North America, citing regions where each occurs.
- Define a *front* and describe its air pressure and circulation.
- Contrast the characteristics of a warm front with those of a cold front citing size, speed, kind of weather, and duration.
- Read a weather map.

Geography of Asia, Australia, and Antarctica

Eighth grade Geography incorporates aspects of all other academic disciplines, both in the humanities and the sciences. The introduction of meteorology, in particular, conveys a vivid impression of the tremendous forces involved in shaping the climate. In addition, by continuing to concern themselves with the cultural life and values of other peoples, students discover that the personality characteristics of peoples differ greatly. This can help young people in their own search for self-definition.

The study begins with the way in which maps influence our perception of the world. Students compare the standard Mercator projection with the Peters projection, which presents continents according to their area. Afterwards they focus on the continents of Asia, Australia, and Antarctica. Students explore Asia by tracing the courses of great rivers and come to know the peoples gathered around these waterways. Asia's cultural stability over thousands of years is contrasted with the consistent change characteristic of Western cultures. The pupils are also introduced to the religious and philosophical streams of Confucianism, Buddhism, Taoism, Shintoism.

At the completion of Grade 8, students should be able to:

- Identify all major geographical features of Asia, and the countries bordering those areas.

- Know the five basic latitudes, and where the continents of the world lie within those latitudes.
- Explain the origin of monsoons and their effect on the life of Southeast Asia.
- Compare the population density of Asia with that of North America.
- Be familiar with and give examples of the terms *delta, silt, archipelago, steppe, plateau.*
- Compare the climate and character of northern China with that of southern China.
- Identify the various religious streams of East Asia and their founders.
- Engage in artistic activity common to other cultures (examples may include Chinese painting, haiku poetry).
- Research independently and develop a project on a particular country or cultural custom.