

# *The Waldorf Science Curriculum*

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The curriculum outline on the following pages is taken from the research monograph, *Does Waldorf Offer a Viable Form of Science Education*, by David Jelinek, Ph.D. and Li-Ling Sun, Ph.D., 2003. While information was gleaned from a variety of Waldorf literature the format and interpretations are those of the monograph authors. That is, this is not an “official” Waldorf science curriculum.

The format is organized in bullet points under 5 categories:

- 1. From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**
- 2. Overview**
- 3. Objectives**
- 4. Topics (Subjects)**
- 5. Strategies**

## Waldorf Science Curriculum Outline for Grade 1

### **From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Knowledge of one’s native land: This subject should be given in such a way as to awaken the dreaming child gradually to a consciousness of his environment, so that he learns to connect himself more and more consciously with his surroundings. Whatever is brought home to his understanding or raised to his consciousness- for instance the well-known plants, animals, stones, mountains, rivers and fields-must be presented by the teacher in an imaginative-moral way fitting to the age of the child, and never in abstract descriptions. For instance, the grandeur, the reverence, the gentleness or wildness of sky, clouds, stars, flowers, animals or stones, must be expressed and stressed as in fairy stories by means of the animated conversations these beings hold one with another.”

### **Overview:**

- Encourages a loving appreciation for the workings of the natural world.
- Dedication to careful observation of natural phenomenon.
- Loving appreciation for nature and its manifestations
- Appreciation for inter-connectedness of all nature
- Holistic vs. reductionist scientific discipline.
- Phenomena of natural world and its various elements are first approached
- Components are the foundations of a later scientific curriculum
- Awe for the natural world
- Understanding factual information is secondary to developing these faculties of awe, respect and inquisitiveness, as well as developing the child’s sensory abilities to observe.
- The science curriculum in grade One consists primarily of the life sciences to support the alive, animated view that a 6-7 year old has of the world

### **Objectives:**

- Reverence and awe for the natural surroundings
- A feeling that nature is alive and not mechanistic
- Understanding and appreciation for seasonal changes and effects upon nature.
- Promotes the connection young children have with the natural world.
- Enhance a child’s wonder, curiosity and enthusiasm for the world and provides opportunities for a child to feel s/he is part of a whole living cosmos.

### **Topics (subjects):**

- Nature stories
- Life Sciences
- Earth Science
- Seasons

### **Strategies:**

- Nature walks
- Seasonal nature stories
- Sensory observation
- Informal discussion
- Drama
- Music
- Art
- First-hand experience

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Writing, Speaking, Reading: From drawing and painting the capital letters the child should be led over to smaller script writing. He should learn to read. He should write down what has been told to him, and later on, give in quite short descriptions what he has learned about plants and animals, meadows and woods. The telling and re-telling of fairy tales should gradually give place to fables and animal stories. The child at this age is still so much connected with his surroundings that he gains the best understanding of animals when they speak and act as human beings. This is the character of the fable. The giving of legends brings into harmony what the child has experienced of the animals through fables, with the picture of the human being in his striving towards completion as represented in the legends. Therefore legends are necessary as an addition to the fables and animal stories.”

**Overview:**

- Encourages a loving appreciation for the workings of the natural world.
- Dedication to careful observation of natural phenomena.
- Loving appreciation for nature and its manifestations
- Appreciation for inter-connectedness of all nature
- Holistic vs. reductionist scientific discipline.
- Phenomena of natural world and its various elements are first approached
- Components are the foundations of a later scientific curriculum
- Awe for the natural world
- Understanding factual information is secondary to developing these faculties of awe, respect and inquisitiveness, as well as developing the child’s sensory abilities to observe.
- The second grade science curriculum strengthens and adds to the ideas of the first grade

**Objectives:**

- Reverence and awe for the natural surroundings
- A feeling that nature is alive and not mechanistic
- Understanding and appreciation for seasonal changes and effects upon nature.
- Support for a child’s sense that s/he is connected to the wholeness of a life-filled world
- To perceive sensorially and to be curious are still the primary objectives of the curriculum.

**Topics (Subjects):**

- Nature stories
- Fables, Native American stories and stories of people who have dedicated themselves to the preservation of nature
- Life and earth sciences

**Strategies:**

- Oral responses to stories
- Artistic responses to stories
- Nature walks
- Nature activities

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Lessons in Practical Life: At this stage the children should learn to connect themselves consciously with their surroundings. For instance they should learn of the preparation of mortar, and of its use in building. They should learn about the tilling, the ploughing and the manuring of the fields, and how to distinguish the different kinds of corn. They should come to realize that the animal needs the plant to feed it, and the plant needs the animal to fertilize it and the mineral to nourish it and give it firm support. This subject should awaken in the children a feeling for the wonderful working together of all things that live in the world, and should cause thankfulness to grow within them towards that which is below Man. But the teachers should always seek to guide the children from the world of the moral feelings to the world of practical life. In this way children can be given the foundation for the writing of business letters and compositions in the later school classes. It is very important that the teacher should give a careful preparation in these early stages for all that will come in the syllabus later on.”

**Overview:**

- Child has entered into the dynamics of the nine year change
- Separateness from natural surroundings is taking hold of child
- Study of home surroundings moves into practical realm of human activities
- Important to stress socially cooperative nature of human activities at this age
- The child is shown the natural world as a place in which the needs of human beings can be met
- More emphasis is placed on the physical and earth sciences
- Help the children gain confidence in growing food, making shelter and clothing. They should learn that the latter is possible and useful.
- Spend a week on a farm

**Observations:**

- Love and appreciation for natural world through observational skills
- Develop understanding of various socially cooperative activities
- Describe various types of shelters constructed around the world

**Topics (subjects):**

- |   |  |
|---|--|
| <ul style="list-style-type: none"><li>• Life Science</li><li>• Earth Science</li><li>• Native American stories</li><li>• Physical Science</li><li>• Farming</li></ul> | <ul style="list-style-type: none"><li>• Clothing</li><li>• Animal Husbandry- interdependence of humans and domesticated animals</li><li>• Plant cultivation</li><li>• Soil conservation</li><li>• House building</li></ul> |
|---|--|

**Strategies:**

- |  |  |
|--|--|
| <ul style="list-style-type: none"><li>• Examine and observe changes in nature through seasons</li><li>• Listen to nature stories</li><li>• Participate in nature walks</li><li>• Farming</li></ul> | <ul style="list-style-type: none"><li>• House building</li><li>• Hands-on involvement</li><li>• Oral work</li><li>• Observation of written work</li><li>• Observation of artistic work</li></ul> |
|--|--|

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Study of Home Surroundings: The more imaginative study of the immediate world around the child is now led over the History and Geography of the neighborhood. The historical development of the familiar objects of the surroundings should be given. For instance the teacher should describe how orchards or farms come into being and how various industries have sprung up.

Nature Study: In the ninth year of the child’s life the teachers should make a transition from the imaginative moral treatment of the Kingdoms of nature to one where the child stands opposite natural objects in a more objective and understanding way. Exact Nature Study begins when the child has achieved a greater objectivity in his own being. In an elementary study of man, the “human being” should be represented in an artistic and reverent way. After this the animal kingdom should be studied but always in its special relationship to man. The teachers should describe single animals and compare their organisms with that of man. Thus the children learn to perceive how the manifold forms of the animal world are unified with order and harmony in the human being.”

**Overview:**

- Child feels separate from natural surroundings.
- Stronger self-consciousness in child
- More inward and independent soul-life
- Transition from imaginative treatment to the child standing opposite the natural world.
- Learn to perceive how the manifest animal forms are unified in the order and harmony of the human being.
- Grade children study animals- their morphology, adaptations, homes, and their relationships to plants and human beings

**Objectives:**

- To instill a deep feeling of awe, appreciation, and respect for the animal kingdom.
- To develop a picture of “threefold physiology” (Nerve-sense, metabolic limb, and rhythmic heart-lung)
- Develop understanding of animal traits and environments animals live in
- Develop picture of animal kingdom with every animal species specialization
- Develop through drawing, painting, modeling, a sense of animal characteristics
- Develop artistic, descriptive skills based on observations of animal life, domestic, local and zoological
- Present a holistic picture

**Topics (subjects):**

- Animal Studies
- Human and Animal
- Life science
- Earth science
- Geography

**Strategies:**

- Drawing
- Painting
- Modeling
- Observation
- Teacher's stories
- Poems
- Write report on an animal
- Use of maps
- Dramatic demonstrations

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Natural History: Some of the less known animals should be described to the children. From the study of man and then of the animal world the teacher passes on to the plant realm. Botany should always be studied in connection with the life of the earth as a living organism. At this period the child’s active healthy longing for causality is satisfied in the right way if he is shown how a certain plant, in a special place and in special climatic conditions, develops this or that form in its different parts.”

**Overview:**

- Zoology with lesser known animals being described
- True sense for plants as offspring of living earth should be imparted to the children
- Show ecological and morphological unity of plant with its environment
- Plants observed and studied in natural environment
- Looking at the individual plant parts and their roles
- To bring forth relationships, comparisons and contrasts- and to bring the material in an artistic way so that the feeling life of a child will be touched.

**Objectives:**

- Develop understanding of plants as standing between earth and sky
- Develop understanding of whole plant as organism which can only be known over time
- Introduce/develop image of four-fold plant (root, stem, leaf, flower)
- Show relationship between plant and insect world
- Develop sense for flower’s relation to warmth and light
- Develop image of tree’s relation to earth
- Develop appreciation for ranking in plant kingdom- from the lower to higher plants
- Develop exact observational skills

**Topics (Subjects):**

- Life science
- Earth science
- Zoology
- Botany (Plant Kingdom)
- Geography

**Strategies:**

- Sketching
- Painting
- Modeling
- Descriptive writing

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Natural History: The teacher should continue to describe the plants and should then pass on to the realm of the minerals. Minerals should be observed only in connection with geography, they should not be treated separately. Only, for instance, when the child has gained a lively picture of the granite mountain range in contrast to the limestone landscape, should the teacher put before him fragments of granite and limestone.

“Physics: In this school year the child is ripe for the first physics lesson. Here also the teacher should follow the natural healthy way for the growing child; that is, the way from the artistic to the intellectual. From music the child should be led to acoustics and then the larynx should be described. Color and painting with which the child has been familiar from the beginning of school-life should lead on to optics, and to the phenomena of color and light. The eye should not be discussed. The child is not yet ready to appreciate the application of physical law to the operation of sense organs in a living body. The teaching of Heat, Electricity and Magnetism can be introduced, starting from phenomena and developing the general laws from them.”

**Overview:**

- Main focus is geology/mineralogy
- Introduce physics
- Move from whole to part
- Nature of imagination should be fully engaged and precede the material, informational experience of the subject
- 4-5 weeks for physics block
- True science based on mystery of discovery
- Students must come to experience and realize the path of knowledge is difficult and very different from the stores of information with which they are inundated
- Teacher’s responsibility to instill in students a sense of appreciation and awe of phenomena
- Emphasis is on how the earth is changing constantly and what is causing this change.

**Objectives:**

- Develop understanding that the mineral kingdom is built upon laws of cause and effect
- Develop understanding of constituent mineral parts of rocks
- Extract geological studies from actual earth forms in which they are found
- Enable students to observe and appreciate difference between variety of crystals and gems, metals, geographic and geologic formations
- Develop understanding for what constitutes discipline of physics
- Discipline and train observational skills
- Appreciate the phenomena of sound, light, heat, and electricity and magnetism
- Learn to write and draw exact descriptions and representations from observation

**Topics (subjects):**

- Geology/mineralogy
- Astronomy
- Physics
- Zoology
- Botany
- Acoustics
- Optics
- Heat
- Electricity
- Magnetism

**Strategies:**

- Demonstrations
- Observation
- Writing
- Drawing

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“**Nature Study:** In the previous school years the pupil has passed from the study of the human being down to the animal kingdom, then to the plant world and to the earth and the single minerals. Observation of nature now should lead him back again to man. The teacher should describe nutrition and conditions of health. At this end of true childhood and at the beginning of puberty the growing boy or girl is at the stage when he can bring understanding and feeling to the subject of nutrition and health without falling into the egoism with which older people generally approach these questions.

“**Physics:** The pupil should learn more about acoustics, optics, heat, magnetism and electricity; also he should learn to know the fundamental laws of the cylinder, the screw, and so forth.

“**Chemistry:** Starting from the familiar process of combustion the children are made acquainted with the first elementary ideas of chemistry. With the concepts already gained in Physics, Chemistry, Geography and Nature Study a general presentation of industrial and economic life is given.”

**Overview:**

- Moving from the mysterious to the mechanically lawful aspects of the physics discipline
- Observation of outer nature should lead back to study of human being
- Elementary ideas of chemistry and how it doesn't exist in isolation
- 1/3 of the year devoted to the science curriculum
- Physics requires 4 weeks
- Students are approached with the scientific, cultural, artistic and practical sides of chemistry and how it relates to industrial and economic life.

**Objectives:**

- Further develop understanding of basic physics, with emphasis on basic mechanics
- Develop understanding of basic human physiology
- Develop understanding of basic inorganic chemistry
- Answer: how has the phenomenon arisen and how does it work?

**Topics (Subjects):**

- |                       |               |
|-----------------------|---------------|
| • Physics             | • Acoustics   |
| • Astronomy           | • Optics      |
| • Intro to Chemistry  | • Heat        |
| • Biology             | • Electricity |
| • Health              | • Magnetism   |
| • Human physiology    | • Mechanics   |
| • Inorganic chemistry |               |

**Strategies:**

- |                        |           |
|------------------------|-----------|
| • Observation          | • Drawing |
| • Written descriptions | • Reports |

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Nature Study: When a pupil is sent forth into life he should take with him a picture of man as the completion of the kingdom of nature, in fact as a microcosm. The markedly contrasting functions of the different organic systems and their harmonious working together should be made clear to him. He has already learned to understand illness and health in connection with the physical body and the soul-spirit being of man. As the pupil becomes ripe in his own development, the teacher can show the mechanism of the bones and muscles and the inner structure of the eye, that is to say he shows all that can be understood about man by means of concepts drawn from the realm of mechanics and physics.

“Physics: The teacher should continue the work begun in the sixth Class and now show its practical application. He should lead on to the teaching of hydraulics, aeromechanics, climatology and meteorology.

“Chemistry: The importance of chemical process for industry is shown and the nature of the organic substances starch, sugar, protein and fat and their significance for human nutrition are studied.”

**Overview:**

- Continued work with geology, physics, and chemistry
- 6-7 weeks needed for physics
- Whole block needed for chemistry and physiology
- Blocks take 1/3 of the year
- Capacity for logical thinking and independent judgment increases
- Student looking out into the world and the future
- Idealism and how knowledge and technology can serve humankind is very important
- Practical applications of physics
- Study of skeletal and muscular systems in physiology
- Also in physiology study of the nervous system, ear, and reproductive systems can be taught
- Wanting to do, to discover, to know and to find relevance in their studies by extrapolating from the classroom to the outside world
- Why, Where, and Who

**Objectives:**

- Further develop understanding of basic fields of physics
- Deepen understanding of basic human physiology
- Develop understanding of skeletal and muscular systems
- Develop understanding of basic organic chemistry and its practical applications

**Topics (Subjects):**

- Geology
- Physics
- Chemistry
- Physiology
- Anatomy
- Acoustics
- Optics
- Heat
- Electro-magnetism
- Hydraulics
- Hydrostatics
- Meteorology
- Aeromechanics
- Industrial/technological revolutions
- Skeletal/muscular systems
- Nervous system
- Ear
- Reproductive system
- Organic chemistry

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

“Nature of Man: The study of the nature of man should be continued.

Chemistry: The elements of organic chemistry should be taken.

Physics: The two most important means of communication, the locomotive and the telephone, are explained. Heat and mechanics are treated until the locomotive can be understood; electricity, magnetism and sound are taken in relation to the telephone. In addition, the motion of the stars in the direction of vision and the Doppler effect are discussed as far as the maturity of the pupils will allow. The necessary optics for this is also treated.”

**Overview:**

- 10 days spent living on a farm and participating in farm activities
- Study structure of bones, joints, cartilage, muscles...
- Principles of sound and thermodynamics are investigated
- Demonstrations of simple substances into more complex substances

**Objectives:**

- Geological phenomena studied to create both a global and local view of geology

**Topics (subjects):**

- Organic Chemistry
- Physics
- Biology
- Geography
- Anatomy
- Farming
- Geology
- Sound, communication, Thermodynamics and Engines
- Health

**Strategies:**

- Experiment
- Discussion
- Hands-on farming
- Observation
- Demonstration

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

**“Natural Science:** In anthropology, the teacher should describe the organs and their functions in relationship with the life of soul and spirit. We should now proceed to ethnography, starting with a study of the human being as an individual. We should also take here mineralogy and crystallography, linking up these subjects with the Geography lessons in which we have described the earth structurally and physically as a whole. We should study the process of the forming of limestone, and its significance throughout the whole earth, as well as in the human and animal organism where it is found in the skull and bone formations. We can then contemplate how the human being has partly to overcome this natural hardening process in order not to become as hardened as the animals. We should also study the metals, giving an exact description of their appearance, their chemical reactions, and their geographical position including their effects on the human organism.

**Chemistry:** The teacher should describe acids, alkalis and salts, and with the help of these leading concepts the pupil should be introduced to the various chemical phenomena and should also discover how these processes are revealed in the living organism. “Acid” and “Alkali”, for instance, remain dead concepts as long as the pupil does not realize that the polarity between them is active in a living way throughout nature, especially in the plant, the animals and in man. In this way we gradually rise from the mere study of the various acids and alkalis from the point of view of inorganic chemistry to an understanding of such contrasts occurring in the animal kingdom as for example between acid food juice and the alkaline blood fluid of the bee.

**Physics:** Mechanics should be taken up to simple machines and projectiles. The parabolic nature of the trajectory of projectiles is worked out.”

**Overview:**

- Laws of force are studied
- Experiment-based development of acids/bases/ salts.
- Study of interaction of air, water, earth and the sun’s heat on weather conditions
- Functions of endocrine system as well as sexual maturation

**Objectives: See Part C.**

**Topics (Subjects):**

- Chemistry
- Physics
- Biology
- Geography
- Physiology
- Meteorology
- Acids/bases/salts
- Climatology
- Inorganic chemistry I
- Health

**Strategies:**

- Experiments
- Discussion

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

**“Nature Science:** In this course should be taken structures of cells, and Botany as far as the Monocotyledons. The teacher should characterize the cell so that the pupils are always aware of the great cosmic relationships which are mirrored even in the smallest substances; for instance when cells divide they repeat the primeval cosmic activities from which they have their being. In Botany it is important to describe the plant in connection with the soil in which it grows and with the influences of the whole universe.

**Chemistry:** An attempt should be made to give a survey of the whole field of chemistry by extending the concepts of acid, alkali and salt. Any separation between inorganic and organic chemistry should be avoided. The presentation should be based on the chemical processes rather than on the chemical elements and the study of the qualities of acid, alkaline, salt-like combustible should precede that of the individual substances. Sulfur for example could be described in such a way that it is primarily regarded as a sulfur process which can be characterized as a part of the volcanic processes of the earth, but also as the force, active in living protein, accelerating and invigorating metabolism in plant, animal and man. The teacher can characterize the substance sulfur as a part of the universal sulfur process in nature, which has come to a standstill as a frozen and hardened fragment. Each substance can be treated in this way. In this permeating all life processes of the earth as, say, sugar or other carbon compounds. Through this way of teaching that which has become rigid and hardened as “matter” can be brought back to life if it is shown how this “matter” turns into an all-embracing process in world and man.

**Physics:** The pupils should study the more modern developments in the realm of electricity, such as telegraphy wireless, x-rays, radioactivity, and so forth.

**Technology:** The teacher should describe water wheels, water turbines, and steam turbines, and make cardboard models. He should speak in great detail of paper factories, and excursions should be made over factories, for instance the pupils should visit a power plant.”

**Overview:**

- Characteristics of electric and magnetic fields are investigated and studied
- The periodic table is developed through experiments and history
- Characteristics of planets, stellar evolution, galaxies are studied.
- Study of morphology of algae though gymnosperms

**Objectives: See Part C.**

**Topics (Subjects):**

- |                          |  |
|--------------------------|--|
| • Chemistry              | • Electricity/ Magnetism and nuclear physics |
| • Inorganic chemistry II | • Periodic table                             |
| • Physics                | • Astronomy                                  |
| • Biology                | • Botany                                     |
| • Biology Lab            | • Environmental science                      |

**Strategies:**

- |               |              |
|---------------|--------------|
| • Experiment  | • Discussion |
| • Observation |              |

**From *The Curriculum of the First Waldorf School* (Rudolf Steiner)**

**“Natural Science:** In Botany the phanerogams should be studied, and this should be followed by a summing up of the Zoology courses. The most important representatives of the animal world should be described and these should be understood as differentiations from the single organic system of the human being into the single organizations of the animal groups. Each animal appears as an elaborated organ or limb of the human being. The animal world is the human being separated off into parts. Thus at the end of his school life the pupil should grasp scientifically what he learnt as a child in his first school days in pictures, in fables and in the simplest lessons in zoology. At the same time all realms of nature should be seen together in a united whole, with the study of man as a central theme running through all the lessons.

**Chemistry:** This subject should also be brought to a conclusion. Through examples the pupils should be enabled to realize how the processes within man, for instance formation of pepsin, etc., are something totally different to those in outer nature.

**Physics:** Optics is taken: light as such, light and matter, photometry, mirrors, refraction and consequent distortion of images. Origin of color, polarization, double refraction

**Technology:** In the study of this subject the pupils should gain a knowledge of raw materials, their origin and their transformation; this should be given in connection with modern developments in economics and labor. Industrial districts should be visited.”

**Overview:**

- Lawfulness of optics is determined through observation of optical phenomena
- 9 week elective course in mathematical physics for solving physics problems, which are mathematical in nature
- Experiment based organic chemistry – transforming substances into more complex organic molecules
- Previous learned material is applied to human biochemistry
- Study of life cycles and morphology of major animal phyla
- Study of human embryology; function of organ systems

**Objectives: See Part C.**

**Topics (Subjects):**

- Physics
- Biology
- Honors program and AP (Varies with school)
- Organic Chemistry
- Bio-chemistry
- Physiology
- Zoology

**Strategies:**

- Observation
- Experiments
- Models