

WINGS PROGRAM GOALS

To develop the student's thinking skills

To develop the student's communication skills

To develop the student's understanding of self and others.

SCIENCE OLYMPIAD

Winter/Spring 2020

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I. Overall Concept Of The Course

Even the simplest everyday event often has a scientific explanation. By experiencing and seeking to understand these simple events, we can come to understand the principles of physical science, which cause them to happen. Having gained this understanding, we can extend our knowledge to encompass the fundamental laws of physics.

II. Unit Rationale

This unit will center on a *Science Olympiad* approach, which includes scientific concepts taken from earth science, physics, chemistry, and life sciences. Each week we will take one basic physical concept, such as gravity, motion, light, or sound, and carry out hands-on experiments, which enhance understanding of that concept. The activities will allow students to frequently construct things to test their hypotheses. They will gather data as they do such things as: time the descent of a parachute, test the trajectory of a rubber band catapult, or fly a giant solar heated bag of science. During the unit students will have the opportunity to experience:

- activities which enable them to operate at complex levels of thought.
- divergent production.
- challenging group and individual work which demonstrates process/product outcomes.
- acceleration of the pace and depth of science content.
- application of abilities to real-world problems.

III. Course Objectives

By the end of this unit the learner will be able to:

- recognize basic physical concepts which are involved in everyday events (such as flight of an airplane or production of sound by a musical instrument).
- demonstrate this recognition by giving a brief explanation of the event being observed.
- demonstrate problem-solving skills by working with a team to construct an apparatus which behaves according to given guidelines.
- identify Newton's three Laws of Motion and give an example of each.
- analyze scientific data after experimentation.

IV. Applied Thinking Skills

The following are the primary thinking skills, which the students will apply while completing this unit:

- *focusing on a question
- *interacting with others
- *synthesizing
- *goal setting/planning/designing
- *deciding on an action
- *creative problem solving
- *interpreting data
- *memorization

V. Applied Affective Skills--

- Students will have the opportunity to recognize personal capabilities.
- Students will develop interpersonal and group process skills.
- Students will develop decision-making skills.

VI. Resources To Be Used:

- Smith, Alastair and Henderson, Corinne, Energy, Forces, and Motion. Usborne Publishing, Ltd., 2001.
- Porter, Alison (ed.) and Davies, Eryl (ed.), How Things Work. Barnes and Noble Books, 2005.
- Jennings, Terry, Energy and Forces. Smithmark Pub., Inc, 1992.
- Jennings, Terry, Electricity and Magnetism. Smithmark Pub., Inc, 1992.
- Rogers, Kirsteen (et al.), Light, Sound and Electricity. Usborne Publishing, Ltd, 2002.
- VanCleave, Janice, 203 Icy, Freezing, Frosty, Cool, and Wild Experiments. John Wiley and Sons, Inc. 1999.
- VanCleave, Janice, 200 Goopy, Slippery, Slimy, Weird and Fun Experiments. John Wiley and Sons, 1993.
- VanCleave, Janice, 201 Awesome, Magical, Bizarre and Incredible Experiments. John Wiley and Sons, 1994.
- VanCleave, Janice, 202 Oozing, Bubbling, Dripping & Bouncing Experiments. John Wiley and Sons, 1996.
- Wiley, David A. and Royce, Christine A. Physical Science. McGraw Hill Pub., 1999.
- Forte, Imogene and Frank, Marjorie, The Basic Not Boring Series of Physical Science. Incentive Publications, Inc. 1997.
- Graham, Ian (et al.) Science Encyclopedia. Dempsey Parr Pub., 1999.
- The Wild Goose Company, Zero to Einstein in 60. 1999.
- Bikel, Charles L. , Neal D. Eigenfeld, and John C. Hogg, Physical Science Investigations. Houghton, Mifflin, 1979
- Science Olympiad: Exploring the World of Science. Division B Rules Manual, Grades 6 - 9, Ward's Science, 2016.
- Science Olympiad: Exploring the World of Science. Division C Rules Manual, Grades 9 - 12, Ward's Science, 2014.
- Epstein, Lewis Carroll. Thinking Physics. Insight Press, 1988.
- The New Book of Popular Science, volume 1. Grolier, 1979.
- Information Gathered from the Internet.
- VanCleave, Janice, Physics For Every Kid. Wylie and Sons, 1991.
- Challoner, Jack. The Visual Dictionary of Physics, 1995, Dorling Kindersley, New York.
- Ehrlich, Robert. Why Toast Lands Jellyside Down, 1997. Princeton University Press, New Jersey .

VII. Student Expectations

- Students will often be working in teams of two to five. They will adhere to the basic guidelines for cooperative learning when working in these groups.
- Students will adhere to safety rules in the laboratory.
- Students will have a proper contract for use of the Internet.
- Students will keep a record of work done during activities. They will be expected to keep careful data, which may be needed for participation in the Phelps Science Olympiad.

VIII. Parent Expectations

- Students' ideas will be enhanced by discussion of some of the activities with parents.
- Any parent with a particular interest in one or more of the activities (such as musical instruments, for example) is eagerly invited to join us as observer or expert.
- Assistance in the actual Olympiad activity in May would be much appreciated. Parents will be needed to act as timers, recorders, etc.

IX. Topics of Study (Monday classes may be compacted due to Monday holidays.)

Week 1 - Pretest

Forces in Nature, Unbalanced Forces and Motion, Paper Rockets
Newton's Law of Gravity--Egg Drop

Week 2-Velocity

Newton's Laws of Motion

Week 3-Terminal Velocity, Parachute Activity, Galileo's Experiment

Trajectory--Rubber Band Catapult

Week 4-Aerodynamics, Bernoulli's Principle, Paper Airplanes

Week 5-Bernoulli II

Newton's First and Third Laws of Motion

Rocketry--Newton's Second Law of Motion

Week 6-Sound, Music--Preparation of a Musical Scale

Natural Frequency--Producing Music by Natural Vibration of Strings, etc.

Week 7- Pressure- Cartesian Diver

Gases, Boyle's Law and Charles' Law

Giant Solar Heated Bag of Science-- (weather permitting)

Week 8- Heat, Solar Energy, "Cool It", "Energy Box"

Week 9- Light, Reflection, Refraction, Color

Week 10- Buoyancy, Archimedes Principle

Pascal's Principle, Paddle Boat Construction

Week 11-Bridges and Structures -Field Trip to Doling Park (Geocaching)

Week 12- Olympiad Event Practice: Straw Tower, Scavenger Hunt, Hangman Science

Week 13-The Physics of Frisbees- Field Trip to Oak Grove Park

Week 14- Field trip to Doling Park to practice GPS and Geocaching

(Above Activities and Schedule are subject to change, as needed.)