Eye of a Scientist

Research methods program for Middle School (MS)

Spring 2025 Syllabus and Program Benefits

Program Overview:

Eye of a Scientist's Spring 2025 program for students in MS is designed to engage students aged 11-14 years of age in science research lessons. Students learn the fundamentals of how the scientific method is applied across the following science fields: geology, physics, biology and neuroscience.

Each lesson will guide students through the scientific method, starting with the observation and hypothesis that sparked the topic in question. Students will have the opportunity to create and test their own hypotheses as they perform activities that will help to develop their fine motor skills in a laboratory setting. Students will model designs in 2D and 3D, measure various substances and their units of measurements, compare, categorize, collect numerical data, analyze and calculate numerical data, and conclude their experiment's results with proper comparisons and graphs. Most importantly, students will be exposed to age-dependent laboratory research tools that include, but not limited to, microscopes, magnifying glasses, pipettes, beakers, graduated cylinders, personal protective equipment (PPE), and more. Every lesson is summarized with the lesson's application of the skill and topic to expand on how the lesson applies in their everyday life.

The following syllabus provides an outline of the Spring 2025 topic lesson schedule. The pre-planned schedule provides a plan that can be subjected to change depending on each group's learning style and educational level. Eye of a Scientist adjusts the lesson content and skills developed to meet a student's abilities. Our main goal is to provide a laboratory setting where students can explore abstract science topics and bring them to life with hands-on projects. Parents will receive a summary sheet of all of the topics and skills covered in each class. Some lessons will include extensions for parents to reinforce at home. Both summaries and extensions will help students and parents to continue to explore topics and skills learned in class throughout the Spring 2025 semester.

Semester Goals:

- Application of the scientific method used for experimental procedures. Development of the planning phase of an experiment, identifying tools required, and performance during active investigation.
- Development of methods used to measure and alter different types of matter.
- Designing functioning model space crafts to observe the effect of forces exerted on them.
- Develop patience, teamwork and peer support in a laboratory setting.
- Learn redesigning original ideas from observed data that promotes problem-solving and critical thinking skills.
- Encourage students to trust and apply their inquiry-based and problem-solving skills in their daily lives.

Spring 2025 Schedule:

A. Weeks 1-3: Earth's features

a. **Week 1. January 6-10, 2025.** Photosynthesis in Action: The use of plants and volume measurement tools to estimate a leaf's active production of oxygen through the promotion or prevention of photosynthesis.

b. **Week 2. January 20-24 2025.** Glucose Content: Designing and building a food oven that will be utilized to produce food chemical reactions; and the active comparison of different kinds of sugars (e.g., glucose and sucrose) in food.
c. **Week 3 February 3-7, 2025.** Blocking UV: Controlled comparison of how effective different brands of sunblock with the same blocking concentration are at blocking UV rays using UV-sensitive color changing beads.

B. Weeks 4-6: Living structures and function

a. **Week 4. February 17-21, 2025.** Chlorophyll: Utilization of a chromatographic methods to visualize, measure, and compare the pigments in different kinds of leaves.
b. **Week 5. March 3-7, 2025.** Plant Food: Measuring the production of starch in plants that have been exposed to different amount of sunlight to make connections between the starch concentration and photosynthesis.
c. **Week 6. March 17-21, 2025.** Bacterial Growth: Performing a gram stain on grown bacterial cultures to measure and label gram-positive versus gram-negative bacteria.

C. Week 7-8: Forces, motion and energy

a. **Week 7. March 31-April 4, 2025.** Newton's Second Law of Motion: Designing and building a functional car with recycled materials and comparing the forces required to achieve a change in motion.
b. **Week 8. April 14-18, 2025.** Newton's Inertia Ring: Using inertia and gravity to achieve a tricky task that compares different approaches.

D. Week 7-8: Central nervous system and behavior

a. **Week 9. April 28-May 2, 2025.** Cellular Proteins: Compare the function and structure of white and red blood cells, and create miniature models of plant and animal cells.
b. **Week 10. May 12-16, 2025.** Microfeatures: Application and mastery of a light microscope to compare the fine structural differences of salt solution samples prepared on glass slides.

Assessment during semester:

- **Openness and participation in using newly presented scientific tools.**
- **Participation of personal ideas and interpretation of the presented science topic.**
- **Presentation of their numerical data in the best fitting graph for the type of data collected and experiment design performed.**
- **Teamwork and peer support across paired/group activities.**
- **Ideas of redesigning solutions to a problem presented**
- **Understanding experimental results from mainly nominal data to express the meaning of their results and topic covered within their age-dependent vocabulary abilities.**