

**Would you like the opportunity to research and learn about anything that interests you from any area of Science or Technology and then design and conduct an experiment within that area, under the guidance of one of the top scientists in that field?**

Sound exciting ? Well, welcome to the

## **Yorktown HS - Science Research Program**

### **Course Overview**

**The science research course is designed to provide students with a chance to pursue scientific research at a college graduate level for 3 years. Motivation, enthusiasm and dedication are essential pre-requisites for success in pursuing in depth research projects of the student's choosing.**

1. Students choose and explore a topic of interest related to:  
physical science, life sciences, computer science, mathematics, or social science, (See other panel for more complete listing).
2. Students are taught the process of online bibliographic researching and are able to access many professional scientific databases. Initially, students use library and Internet research tools to identify specific subjects currently being studied within their chosen area.
3. Students prepare a list of advanced questions regarding their chosen area, based on their bibliographic research, and then proceed to find the answers to those questions. This helps them to significantly advance their knowledge as well as motivates them to analyze their topic on a professional level.
4. Students find and study several scientific journal articles then present the information from some of their articles to the class. Their presentation to the class emphasizes how the research described in the articles was conducted as well as the significance of the findings. This highlights the scientific method, which is an essential part of the entire research course:

*Review of the literature, Statement of the Hypothesis, Methodology of the experiment, Discussion of the Data, Analysis of the results, Conclusions and Significance of findings.*

5. Once a significant amount of background material is acquired and a strong sense of understanding is gained, the student makes contact with a research scientist within their field of interest. Often this is one of the authors of the articles they have read. At that time, the student asks the scientist to serve as a mentor, or to help in finding an appropriate scientist, in assisting them in carrying out a research project in their area of interest over the upcoming summers and following school years.
6. Students then engage in an original piece of research that they design and conduct under the supervision of their mentor. Most often this occurs at the lab where the mentor does their research.
7. Due to the extensive amount of time many of the research projects demand, and the continuity required, the majority of the research takes place over the next two summers with some work being done to maintain the project during the Junior year of school. Students therefore must schedule their summers appropriately
8. The classroom teacher meets with each individual and the entire research class on a regular basis.

9. As a Junior and Senior the student will not only actively continue their research but they will write a final research paper and enter all possible science competitions to present their research:

Westchester Science & Engineering Fair, Intel Science Talent Search, Siemens/Westinghouse Science Competition, Junior Science & Humanities Symposium, TriCounty Science Fair, Intel International Science and Engineering Fair

## YHS / College Credit

The Science Research Program is an elective course taken in addition to the traditional science courses, (Bio.,Chem.) but worth three additional Regents credits for each school year successfully completed.

In addition, SUNY Albany has granted up to 12 college credits to students who successfully complete three years and two summers of research as prescribed in the course curriculum.

## Areas of Research

**Behavioral and Social Sciences** - Human + animal behavior, psychology, sociology, anthropology, archaeology, linguistics, learning, perception.

**Biochemistry** - Chemistry of life processes, molecular biology, molecular genetics, enzymes, photosynthesis, blood chemistry, protein chemistry, hormones.

**Botany** - Agriculture, agronomy, horticulture, forestry, taxonomy, physiology, pathology, genetics, hydroponics, algae.

**Chemistry** - Physical chemistry, organic chemistry, inorganic chemistry, materials, plastics, fuels, pesticides, metallurgy, soil chemistry.

**Computer Science** - Hardware + software engineering, graphics, data structures, encryption.

**Earth and Space Sciences** - Geology, minerology, oceanography, meteorology, climatology, astronomy, seismology, geography.

**Engineering** - Civil, mechanical, aeronautical, chemical, electrical, photographic, sound, automotive, marine, heating and refrigerating, transportation, environmental.

**Environmental Science** - Ecology, pollution studies.

**Gerontology** - Study of the aging process in living organisms.

**Mathematics** - Calculus, geometry, abstract algebra, number theory, statistics, complex analysis, probability.

**Medicine and Health** - Diseases/health, dentistry, pharmacology, pathology, ophthalmology, nutrition, dermatology, allergies, speech + hearing.

**Microbiology** - Bacteriology, virology, protozoology, fungi, bacterial genetics, yeast.

**Physics** - Music, optics, acoustics, particle, nuclear, atomic, plasma, superconductivity, thermodynamics, semiconductors, magnetism, quantum, mechanics, biophysics.

**Zoology** - Animal genetics, ornithology, ichthyology, herpetology, entomology, paleontology, cellular physiology, circadian rhythms, physiology, studies of invertebrates.

## Examples of Science Research experiments designed and conducted by YHS students

The effects of a high fat diet on the occurrence of prostate cancer.

Identification of the Genes involved in Muscle Atrophy and Hypertrophy.

Design and Fabrication of a Collapsible Kayak.

Analyzing and improving Internet Search Engines.

The Effects Of Game Playing on the Symptoms and Cognition of Patients with Schizophrenia.

The effects of Glial Growth Hormone on the developing brain.

The effects of vitamin A in combating Breast Cancer.

Using a natural fungicide to control the tick population that transmits Lyme disease.

Creating multi-agent robots that can communicate with each other to accomplish a task.

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