Introduction to Science Research
2024-2025

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COURSE INFORMATION

As the teacher of the Research 1 course, I would like to take this opportunity to welcome you to the first year in this program. This program will provide students with opportunities to further develop their independent science research skills. I will help students develop these skills through a year-long research project in science, math, or technology.

The research class meets for one period every day for a full year. The progress of each student will be evaluated by successful completion of the course requirements which include the completion of a major science project. The progress of each student will be evaluated by successful completion of the course requirements with an emphasis on research design, writing and presentation skills. Participants in the course are encouraged to continue in the research program throughout their high school career.

I have created a comprehensive science research google classroom containing program information, due dates, useful research tools and pertinent Internet links. As always, if you have any questions or require further clarification about the research program, please do not hesitate to contact me. I look forward to working together with you to ensure a successful learning experience.

Grading-
Attendance and Participation- 15%
Assignments- 85%

Course Description and Prerequisite Skills

This program is a collaboration between Syracuse University's iLEARN Program, Project Advance and high schools science departments. The program involves a multi-year approach, with each year focused upon the exploration of different aspects of scientific inquiry and discovery. University credit (URP 150/250) is provided for students enrolled in their junior and senior years (4 credits per year). Often, however, students will begin in their sophomore years. Each year of the program is focused upon different broad themes in exploring scientific research. These themes progress from an in-depth examination of the scientific method itself through the completion of a significant research experience for the student. These themes may be considered as exploring the "basic tools of scientific research and discovery", the "process of scientific research" and the "results of scientific research".

- The typical program would consist of several years of involvement (optionally starting in the sophomore high school year) such as:
    - Research 1 and 2
        - **<u>"Basic Tools of Scientific Research and Discovery"</u>**. *Basic Concepts*: what is scientific research, what is the scientific method, understanding basic research tools, discerning real science v. pseudoscience, how to pose a valid scientific question, how to read critically a scientific paper, how a research paper is constructed, development of student communication and presentation skills (talks, posters, etc.), how to collect data and keep an appropriate notebook/journal, understanding the stylistic considerations of scientific communication (e.g., citations, paper sections and format, etc.), fundamentals of basic statistical analysis, and others.
    - Research 3
        - **<u>"Process of Scientific Research"</u>**. *Basic Concepts*: How to define, develop and refine a detailed scientific research project, how to complete background literature searching, how to prepare a research proposal with a plan of investigation, how to identify/locate a mentor or research instructor (extramural or intramural), how a research project is begun and continues in experimental work. Some students may profitably identify their mentors early in this process.
        - **<u>As a result, students are expected to</u>**:
            - Identify a research project and prepare a detailed plan for execution;
            - Gain experience presenting, both orally and in writing;
            - Gain experience presenting critical reviews of papers in the scientific literature relevant to the research;
            - Conduct hands-on research experimentation.
    - Research 4
        - **<u>"Results of Scientific Research"</u>**. *Basic Concepts*: continuing a project towards completion of the research experimentation and evolution of project, how to compile, analyze and interpret data from experiments, how to write up research in standard scientific format (depends on field but consistent with papers published in the field), and how to present research at symposium or similar meeting.
        - **<u>As a result, students are expected to</u>**:
            - Complete a significant research project including the collection, analysis and interpretation of primary experimental data;
            - Present project in a public forum;
            - Prepare a manuscript in a fashion suitable for publication in a journal appropriate to their field of inquiry.

Learning Goals:

The fundamental goal of the program is to encourage students to encounter scientific disciplines in a first-hand fashion through both a deeper exploration of the fundamental process of science discovery itself and through carefully guided research projects in which they are full participants. Specific goals of the program include:

- Identify and foster talented, interested and motivated students focused on science research leading to science-based careers;
- Provide students an accurate and detailed understanding of what constitutes high-quality research and how to distinguish this from pseudoscientific work;
- Provide students with the basic tools required to conduct research such as:
    - An ability to read, understand and discuss work reported in the primary scientific literature;
    - An understanding of how to frame an important scientific question into a testable hypothesis;
    - An ability to design and evaluate an experimental research plan to test a hypothesis;
    - An ability to work effectively as part of a team in problem-solving;
    - A basic understanding of statistical methods for research;
- Provide opportunities for students to design, develop, execute, complete, and communicate high-quality research projects;
- Promote independent and critical thinking;
- Provide College credit for science research work.

Attendance and Participation Policy:

1. Students who may need special consideration due to a physical or learning disability should see the instructor as soon as possible. **No provisions** will be made if notified **after** examinations.
2. No student will be refused admission because he or she is unable to participate in a course requirement because of his or her religious holy day requirements. Again, you must make provisions **before** such absences. According to University policy, "an opportunity to make up examinations and other class work [due to religious observances] will be provided...if the **instructor is notified in writing one week before the absence**."
3. Excuses from class for medical reasons will only be given if such absences are advised by a health care provider or the Health Center based upon clinical findings and prescribed treatment recommendations. Verification must be made in writing. Such absences **may** be verified.
4. Attendance in classes is expected. Unannounced attendance checks may be taken during the semester.

Syracuse University Policies

Academic Integrity:

Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide a signature agreeing to abide by them. For more information about the policy, see http://academicintegrity.syr.edu.

Academic Accommodations

Syracuse University welcomes people with disabilities and, in compliance with the Rehabilitation Act of 1973 and the Americans with Disabilities Act, does not discriminate on the basis of disability. Students who require special consideration due to a learning or physical disability or other situation should make an appointment with the course instructor as soon as possible.

Student Work

It is understood that registration for and continued enrollment in this course constitutes permission by the student for the instructor to use for educational purposes any student work produced in the course, in compliance with the federal Family Educational Rights and Privacy Act (FERPA). After the completion of the course, any further use of student work will meet one of the following conditions: (1) the work will be rendered anonymous through the removal of all personal identification of the student(s); or (2) written permission from the student(s).