

<b>GUIDELINES FOR RESEARCH PRACTICUM CLASS OF 2013</b>
--

One requirement for the completion of the Science and Technology Program is the successful completion of the course Research Practicum. Students will learn and apply the basic skills of research. They will design an experiment to answer a research question. The major requirements are: (1) a research project which is either experimental or design and development; (2) the project must be approved by the Research Practicum teacher; (3) conclusions must be supported by sufficient data which will be tested statistically (if statistics are inappropriate, the student must be guided by a researcher); (4) presentation of research by student through presentations in class, at the school science fair, and at the Research Practicum Symposium; (5) five chapter paper. If a student does not submit an acceptable final paper, he or she will not pass the course and thereby will not graduate as a member of the Science and Technology Program.

A number of students have requested that guidelines for the research project be given before the end of the school year. Now is the time to begin finding a research topic. Discuss possible ideas with an R.P. Instructor, a science or engineering teacher, or Ms. Hemelt. Some of you might have the opportunity to begin a project during the summer. You can contact Ms. Hemelt during the summer at school at 513-5400. Leave a message if she is not available when you call. It could be a waste of time and effort to collect data and think you have an acceptable project, if it has not been approved and guided.

The project must follow either an experimental design or a design and developmental design. Projects in the Biological Sciences or Physical Sciences must follow the experimental design. Projects in the Pre-Engineering/Technology areas must follow either the experimental design or the design and development design.

An **experimental design** must:

- ✓ contain a dependent and independent variable, must be part of the design (observational studies are permitted only if the student is working under the guidance of a mentor and must be approved by the R.P. teacher)
- ✓ include a hypothesis, which can be tested statistically
- ✓ focus on changing the independent variable, and then measuring the dependent variable
- ✓ include a statistical analysis of the data
  1. A **significant** statistical measurementOr
  2. A **correlation** between the independent and dependent variables (This means that you will determine if a plot of the independent variable vs. the dependent variable yields a linear relationship)

A **design and development project** must:

- ✓ involve the selection of a problem that requires an engineering solution including:
  - ✓ refinement of a current solution
  - ✓ developments of a new solution
  - ✓ analysis of possible solutions

Your project **must deal** with your focus area (Biological Science, Physical Science, Pre-Engineering). If your focus area is Science/Engineering Exploration, the area of research you choose must be reflective of the Advanced Science/Tech courses taken from Grades 10-12.

**Possible Research Areas in Biological Sciences include:**

Biochemistry  
Botany  
Environmental sciences  
Medicine and health  
Microbiology  
Zoology

**Possible Research Areas in Physical Sciences include:**

Biochemistry  
Chemistry  
Computer science  
Environmental science  
Mathematics  
Physics

**Possible Research Areas in Engineering include:**

Acoustical  
Aeronautical  
Automotive  
Biological  
Construction and testing  
Electrical  
Environmental  
Heating and refrigeration  
Manufacturing  
Marine  
Materials  
Mechanical

A NUMBER OF STUDIES HAVE INCLUDED AN OVERLAPPING OF SEVERAL OF THESE TOPICS. FOR EXAMPLE, A STUDY WAS PERFORMED SEVERAL YEARS AGO IN WHICH THE STUDENT COMBINED THE FIELDS OF COMPUTER SCIENCE, PHYSICS, AND ENGINEERING.

Keep in mind the time frame in which your data collection must be completed. Some projects might require 1 to 3 months for data collection; other projects will require more time. As you are selecting your project, choose one that fits into your own time frame.

If you are working with a mentor be sure he/she is aware of this time factor.

Be aware of the time of year you will be conducting your research. For example, some bacteria grow only during certain seasons of the year.

At the beginning of the year, your R.P. teacher will give you projected dates of major assignments for the entire year. You will need to plan accordingly.

If you have a mentor, give him/her a copy of these dates. Your mentor must be aware of the deadlines of assignments set by your R. P. teacher.

*Students who begin their research during the summer are at an advantage.* However, if you do not begin your research until the fall, you can still have an outstanding project. The R. P. staff will assist you along each step of your project.

*Any student beginning their research during the summer must be mindful of the following:*

1. Projects must be approved before beginning the project. Proposals forms are available in the Science/Tech Office as well as on the school web page and Blackboard.com
2. All ISEF documents must be approved by Dr. Martin prior to collecting any data. Students can certainly learn the necessary protocols or even run a pilot test while waiting approval from Dr. Martin.

There are certain areas of study, which are not permitted for R. P. research, i.e.:

1. No surveys/questionnaires are permitted.
2. No studies in psychology are permitted.
3. No historical studies are permitted.

Students often comment that the hardest part of R.P. is formulating the research topic. Once students know what they will be investigating, many aspects of R. P. fall into place. Some times of the year are more demanding than others. Being a good time manager is one of the keys to a successive R. P. project. The Science/Tech teachers and Ms. Hemelt will give you any assistance and support needed.